

### **REMARKS**

In the office action dated April 6, 2007, the examiner rejected claims 1-13 under 35 U.S.C. 112, second paragraph as being indefinite. The examiner also rejected claims 1-3, 5-8, and 10 under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 6,357,223 to Caren, et al. Additionally, the examiner rejected claims 1-13 under 35 U.S.C. 103(a) as being obvious over the Caren, et al. reference.

Prior to the present amendment, claims 1-13 were pending. By this amendment, applicants have amended claims 1 and 2. Accordingly, claims 1-13 are under examination.

Claims 1 was amended to specify that the off-gas stream is from a gas-fired plant which is also mentioned in the claim's preamble and supported in the specification at, *inter alia*, page 4, lines 4-6. Accordingly, no new matter has been entered by this amendment.

### **THE INVENTION**

The present invention relates to a method for purifying off-gases, *i.e.*, exhaust gases, from gas-fired plants. Gas-fired refers to the burning of natural gas within the engine. The exhaust from such engines includes methane and NO<sub>x</sub>. Applicants have discovered that off-gas streams of gas-fired plants can be treated by plasma-assisted catalytic methane conversion. The off-gas stream is contacted with plasma and a catalyst to reduce the methane and, possibly, the NO<sub>x</sub> contents of the exhaust.

### **35 U.S.C. 112, SECOND PARAGRAPH REJECTION**

Claims 1-13 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite. According to the examiner, claims 1 and 2 lack antecedent basis for "the methane content" and "the NO<sub>x</sub> content," respectively.

Applicants have amended claims 1 and 2 to remove the word "the." Accordingly applicants request withdrawal of the rejection of claims 1-13 under 35 U.S.C. 112, second paragraph.

**35 U.S.C. 102 REJECTION**

Claims 1-3, 5-8, and 10 were rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 6,357,223 to Caren, et al. According to the examiner, Caren, et al. disclose a method and an apparatus for the reduction of the amount of pollutants, such as carbon monoxide, hydrocarbons, and oxides of nitrogen, in the exhaust gas stream produced by the high temperature combustion of fuel. The examiner alleges that the corona discharge disclosed by Caren, et al. is the same as the "plasma" claimed in the present invention, and that since the corona discharge device is mounted within the catalytic converter, the whole off-gas stream is being treated.

Applicants respectfully disagree. Claim 1, as currently amended, is directed to the treatment of off-gasses, *i.e.*, exhaust gases, resulting from a gas-fired plant. Gas-fired plants run on natural gas consisting primarily of methane.

The Caren, et al. '223 reference, however, is directed to treating exhaust produced by automobile engines. For example, the claims of the Caren, et al. '223 reference are directed to treatment of gas streams from mobile vehicles and Fig. 1. of Caren, et al. shows a diagram of a car's engine and exhaust system. Additionally, Caren, et al. state:

The present invention is directed to a method and apparatus for improving and maintaining the performance of catalytic reactors and catalytic converters, particularly catalytic reactors used in fuel cells for producing electricity and vehicle catalytic converters used to reduce the emission of pollutants.

See the Caren, et al. '223 reference, col. 1, lines 18-23.

Caren, et al. do not disclose a method for treating exhaust from a gas-fired plant. In particular, Caren, et al. do not contemplate gas-fired plants, and thus are not enabling for gas-fired plants. Accordingly, the finding of anticipation must be withdrawn since Caren, et al. do not teach each element of the claimed invention.

**35 U.S.C. 103 REJECTION**

Additionally, claims 1-13 were rejected under 35 U.S.C. 103(a) as being obvious over the Caren, et al. '223 reference. The examiner states that it would have been obvious to treat

a portion or the entire exhaust gas stream produced by the high temperature combustion of fuel to reduce the level of pollutants such as CO, HC, and NO<sub>x</sub>.

Applicants respectfully disagree. As discussed above, the Caren et al. '223 reference is directed to automobile exhaust systems whereas the present invention is directed to gas-fired plants. Accordingly, the present invention is tailored to treating exhaust, *i.e.*, methane, from natural gas engines in industrial plants.

However, the Caren, et al. '223 reference discloses only treatment of exhaust from automobile engines. Automobile engines and gas-fired plants produce vastly different exhaust streams, and as such require different methods for treating the exhaust streams.

Caren, et al. state in the abstract that "catalyst poisons, such as sulfur, sulfur containing compounds, phosphorus, phosphorus containing compounds, and carbon" are reduced or eliminated by the apparatus. A person of ordinary skill in the art would have no reason to use the teachings of an automotive reference in order to create a method for treating exhaust from a gas-fired plant.

Thus, the Caren, et al. '223 reference constitutes non-analogous art, and claims 1-13 are not obvious in light of the Caren, et al. '223 reference.

Additionally, the Caren, et al. '223 reference does not render claim 9 obvious. Claim 9 is directed to the temperature at which the method is carried out, *i.e.*, 300-500°C.

The only operating temperature listed in the Caren, et al. '223 reference is "on the order of about 800 °C" with a contemplated temperature change of about 200 °C. See the Caren, et al. '223 reference, col. 15, line 67 to col. 16, line 9.

A person of ordinary skill in the art would not rely upon a reference teaching a method of purifying automobile exhaust at temperature of about 800 °C to create a method of purifying off-gases from a gas-fired plant at 300-500°C. The 300 °C difference in operating temperatures between the claimed invention and the disclosure of the Caren, et al. '223 reference by itself leads to the conclusion of unobviousness. Accordingly, the Caren, et al. '223 reference provides no reasonable basis to create a method of using a plasma and catalyst for treatment of exhaust from an off-gas plant.

Applicants respectfully submit that the application is now in proper form for allowance, which action is earnestly solicited. If resolution of any remaining issue is required prior to allowance of the application, it is respectfully requested that the examiner contact applicants' attorney at the telephone number provided below.

Respectfully submitted,

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